First Hit Fwd Refs Previous Doc Next Doc Go to Doc#

☐ Generate Collection Print

L1: Entry 2 of 3 File: USPT Aug 31, 1993

US-PAT-NO: 5241465
DOCUMENT-IDENTIFIER: US 5241465 A

TITLE: Method for determining optimum schedule in computer-aided scheduling system

DATE-ISSUED: August 31, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Oba; Michiko	Ikeda			JP
Komoda; Norihisa	Kawasaki			JP
Kawashima; Kazuhiro	Yokohama			JP
Hara; Keiichi	Kawasaki			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Hitachi Ltd.	Tokyo			JP	03
Hitachi Microcomputer System Ltd.	Tokyo			JP	03

APPL-NO: 07/ 690820 [PALM]
DATE FILED: April 23, 1991

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	2-113742	April 27, 1990

INT-CL: [05] G06F 15/22, G06F 15/20

US-CL-ISSUED: 364/401; 364/402, 364/408
US-CL-CURRENT: 705/8

FIELD-OF-SEARCH: 364/401, 364/402, 364/408, 395/904

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5111391	May 1992	Fields et al.	364/401

OTHER PUBLICATIONS

Michael J. Shaw, "Knowledge-Based Scheduling in Flexible Manufacturing Systems: An Integration of Pattern-Directed Inference and Heuristic Search", International Journal of Production Research, vol. 26, No. 5, 1988, pp. 821-844 (Provided in English).

ART-UNIT: 231

PRIMARY-EXAMINER: Envall, Jr.; Roy N.

ASSISTANT-EXAMINER: Tran; Khai

ATTY-AGENT-FIRM: Fay, Sharpe, Beall, Fagan, Minnich & McKee

ABSTRACT:

In a method for determining an optimum scheduling in a computer-aided scheduling system the data associated with a schedule to be generated is previously stored in a memory data. A strategy decision table showing therein one or more scheduling strategies suitable for a plurality of the states in a scheduling process is prepared. An optimization definition table indicating degree of improvement precedence or precedence order of the scheduling strategies of the evaluation items, where degree of improvement precedence is defined as degree of improvement of evaluation value of he evaluation item in changing of the scheduled strategy, is prepared. A schedule is generated by repetition of selecting and executing the scheduling strategies by using the strategy decision table. The other schedules are generated by changing the scheduling strategy selected in the state of the scheduling process by using the optimization definition table. An optimum schedule having the best evaluation value is selected.

10 Claims, 22 Drawing figures

Previous Doc Next Doc Go to Doc#

L1: Entry 1 of 3 File: USPT Apr 7, 1998

US-PAT-NO: 5737728
DOCUMENT-IDENTIFIER: US 5737728 A

TITLE: System for resource assignment and scheduling

DATE-ISSUED: April 7, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sisley; Elizabeth M.	Woodbury	MN		
Collins; John E.	Hudson	WI		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Minnesota Mining and Manufacturing Company	Saint Paul	MN			02

APPL-NO: 08/ 440770 [PALM]
DATE FILED: May 15, 1995

PARENT-CASE:
This is a continuation of application Ser. No. 08/201,664 filed Feb. 25, 1994, 5,467,268.

INT-CL: [06] G06 F 17/60

US-CL-ISSUED: 705/8; 705/9, 364/468.05, 364/468.06
US-CL-CURRENT: 705/8 ✓ 700/100 ✓ 700/99 ✓ 705/9 ✓

FIELD-OF-SEARCH: 364/41R, 364/402, 364/403, 364/468.05, 364/468.06, 395/902, 395/903, 395/906, 395/208, 395/209, 705/8

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4092718	May 1978	Wendt	364/436
☐	4212069	July 1980	Baumann	364/467
☐	4799162	January 1989	Shinkawa et al.	364/436
☐	4937743	June 1990	Rassman et al.	364/401

☐	5099431	March 1992	Natarajan	364/468
☐	5122959	June 1992	Nathanson et al.	364/436
☐	5177684	January 1993	Harker et al.	364/436
☐	5241465	August 1993	Oba et al.	364/401
☐	5255181	October 1993	Chapman et al.	364/401
☐	5295065	March 1994	Chapman et al.	364/401
☐	5325292	June 1994	Crockett	364/401

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0 400 789	May 1990	EP	

OTHER PUBLICATIONS

Fraternall, "A Knowledge Based Architecture for Incremental Scheduling", IEEE, May 1991, pp. 850-854.
Collins et al., "Automated Assignment and Scheduling of Service Personnel", IEEE Expert, vol. 9, No. 2, Apr. 1994, pp. 33-39.
Sycara et al., "Distributed Constrained Heuristic Search", IEEE Transactions on Systems, Man and Cybernetics, vol. 21, No. 6, Nov. 1991, pp. 1446-1461.
H. Berliner and G. Goetsch, "A Study of Search Methods: The Effect of Constraint Satisfaction and Adventurousness," in Proceedings of the Ninth International Joint Conference on Artificial Intelligence, vol. 2, Aug. 18-23, 1985, pp. 11079-11082.
J.E. Collins and E.M. Sisley, "AI in Field Service: The Dispatch Advisor," in Working Notes, AI in Service and Support: Bridging the Gap Between Research and Applications, Eleventh National Conference on Artificial Intelligence, Washington, D.C., Jul. 11-15, 1993, pp. 26-37.
T. Dean and M. Boddy, "An Analysis of Time-Dependent Planning," in Proceedings of the Seventh National Conference on Artificial Intelligence, A.A.A.I., 1988, pp. 49-54.
M.S. Fox, N. Sadeh, and C. Baykan, "Constrained Heuristic Search," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence (IJCAI), Detroit, Michigan, vol. 1, Aug. 20-25, 1989, pp. 309-315.
M.S. Fox and S.F. Smith, "ISIS--A Knowledge-Based System for Factory Scheduling," Expert Systems, vol. 1, No. 1, 1984, pp. 25-49.
E. Ghalichi and J. Collins, "The Dispatch Advisor," in Proceedings of the Workshop on Artificial Intelligence for Customer Service and Support, Eighth IEEE Conference on Artificial Intelligence Applications, Monterey, California, Mar. 3, 1992, pp. 60-68.
D.L. Haugen, "A Study of Scheduling and Quality of Field-Service Support Systems," Ph.D. Thesis; University of Minnesota, Nov. 1993, pp. 1-251.
A.V. Hill, "An Experimental Comparison of Dispatching Rules for Field Service Support," Decision Sciences, vol. 23, No. 1, Winter 1992, pp. 235-249.
A.V. Hill, "An Experimental Comparison of Human Schedulers and Heuristic Algorithms for the Traveling Salesman Problem," Journal of Operations Management, vol. 2, No. 4, Aug. 1982, pp. 215-223.
A.V. Hill, V.A. Mabert, and D.W. Montgomery, "A Decision Support System for the Courier Vehicle Scheduling Problem," OMEGA Int. J. of Mgmt. Sci., vol. 16, No. 4, 1988, pp. 333-345.
A.V. Hill, J.D. Naumann, and N.L. Chervany, "SCAT and SPAT: Large-Scale Computer-Based Optimization Systems for the Personnel Assignment Problem," Decision Sciences, vol. 14, No. 2, Apr. 1983, pp. 207-220.

A.V. Hill and D.C. Whybark, "Comparing Exact Solution Procedures for the Multi-Vehicle Routing Problem," The Logistics and Transportation Review, vol. 12, No. 3, 1976, pp. 145-153.
A.V. Hill and D.C. Whybark, "Chexpedite: A Computer-Based Approach to the Bank Courier Problem," Decision Sciences, vol. 13, No. 2, Apr. 1982, pp. 251-265.
R. Hublou, "Manufacturing Operations Scheduling," Business Intelligence Program Report D90-1436, SRI International, May 1990, pp. 1-39.
B. Kalantari, A.V. Hill, and S.R. Arora, "An Algorithm for the Traveling Salesman Problem with Pickup and Delivery Customers", European Journal of Operational Research, vol. 22, No. 3, Dec. 1985, pp. 377-386.
H. Prade, "Using Fuzzy Set Theory in a Scheduling Problem: A Case Study," Fuzzy Sets and Systems, vol. 2, No. 2, 1979, pp. 153-165.
P. Prosser, "A Reactive Scheduling Agent," in Proceedings of the Eleventh International Joint Conference on Artificial Intelligence, Detroit, Michigan, Aug. 20-25, 1989, pp. 1004-1009.
S.F. Smith, "The OPIS Framework for Modeling Manufacturing Systems," Tech Report CMU-RI-TR-89-30, Carnegie-Mellon University, Dec. 1989, pp. 1-56.
J. Tsitsiklis, "Special Cases of Traveling Salesman and Repairman Problems with Time Windows," Report LIDS-P-1987, Massachusetts Institute of Technology, Jun. 1990, pp. 1-23.
W. Chiang, and M.S. Fox, "Protection Against Uncertainty in a Deterministic Schedule," in Proceedings of the Fourth International Conference on Expert Systems in Production and Operations Management, Hilton Head, South Carolina, May 1990, pp. 184-196.
D. Whitley, T. Starkweather, and D. Shaner, "The Traveling Salesman and Sequence Scheduling: Quality Solutions Using Genetic Edge Recombination," Handbook of Genetic Algorithms Chapter 22, 1991, pp. 350-372.
M. Zweben, "Constraint-Based Simulated Annealing: An Iterative Improvement Framework for Constraint Satisfaction Search," NASA Ames Research Center, Moffett Field, California, Aug. 9, 1990, pp. 1-13.
M. Zweben, M. Deale, and R. Gargan, "Anytime Rescheduling," in Proceedings of a Workshop on Innovative Approaches to Planning, Scheduling and Control, San Diego, California, Nov. 5-8, 1990, pp. 251-259.

ART-UNIT: 241

PRIMARY-EXAMINER: Hayes; Gail O.

ASSISTANT-EXAMINER: Hughet; William N.

ATTY-AGENT-FIRM: Bauer; William D.

ABSTRACT:

A system and method for assigning and scheduling resource requests to resource providers use a modified "best-first" search technique that combines optimization, artificial intelligence, and constraint-processing to arrive at near-optimal assignment and scheduling solutions. In response to changes in a dynamic resource environment, potential changes to an existing assignment set are evaluated in a search for a better solution. New calls are assigned and scheduled as they are received, and the assignment set is readjusted as the field service environment changes, resulting in global optimization. Each search operation is in response to either an incremental change to the assignment set such as adding a new resource request, removing a pending resource request, reassigning a pending resource request, or to a request for further evaluation. Thus, the search technique assumes that the existing assignment set is already optimized, and limits the task only to evaluating the effects of the incremental change. In addition, each search operation produces a complete assignment and scheduling solution. Consequently, the search can be terminated to accept the best solution generated so far, making the

technique an "anytime" search.

52 Claims, 10 Drawing figures

Previous Doc Next Doc Go to Doc#